UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION
WASHINGTON, D.C. 20555-0001

July 2, 1997

NRC INFORMATION NOTICE 97-45: ENVIRONMENTAL QUALIFICATION DEFICIENCY FOR CABLES AND CONTAINMENT PENETRATION PIGTAILS

Addressees

All holders of operating licenses or construction permits for nuclear power reactors.

Purpose

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice to alert addressees to a potential environmental qualification (EQ) deficiency for cables and containment penetration pigtails. It is expected that recipients will review the information for applicability to their facilities and consider actions, as appropriate to avoid similar problems. However, suggestions contained in this information notice are not NRC requirements; therefore, no specific action or written response to this notice is required.

Description of Circumstances

While investigating high-range radiation monitor (HRRM) output fluctuations, Southern California Edison (the licensee for the San Onofre plant) noted that the monitor output appeared to be affected by environmental factors (temperature, air flow, electronic noise, and so on). Accordingly, Southern California Edison initiated additional EQ testing to reassess the environmental qualification of the HRRMs and signal cables. HRRMs provide information to assist plant operators in diagnosing and responding to events.

For the EQ reassessment testing, Southern California Edison conducted steam chamber tests for the Rockbestos RSS-6-104/LE coaxial cable and the Amphenol (N) style connector combination used for the HRRMs. On June 11, 1996, Southern California Edison concluded that moisture could permeate the HRRM coaxial cable jacket during an accident and cause partial shorting of the monitor signal at the penetration pigtail connectors. Because of the extremely small signal current output from the HRRMs (nominally, pico-amperes), this partial shorting of the signal would be sufficient to cause the HRRMs to be inoperable.

Based on the results obtained from additional testing, Southern California Edison replaced the organically insulated cable and penetration pigtails inside containment at San Onofre Unit 2 with stainless steel jacketed, mineral insulated cable and solid conductor containment electrical penetrations. Testing of the new equipment configuration confirmed that EQ requirements for this application were satisfied. Similar repairs for San Onofre Unit 3 will be completed during its Cycle 9 refueling outage.

Discussion

In Licensee Event Report (LER) Number 96-005-01 (Accession No. 9702130104), Southern California Edison indicates that lack of integrated testing of the system as a whole may have contributed to the above-described EQ deficiency. During initial plant licensing, EQ testing for the HRRMs, signal cables, and terminating connectors was performed on the discrete components and each discrete component satisfied its specific EQ acceptance criterion (insulating integrity).

The geometric configuration of cable/connector/penetration assembly combinations used to connect HRRMs may also contribute to potential environmentally induced failures. At San Onofre, the cable runs for the four HRRMs (two in each unit) vary from 175 to 250 feet inside containment. Of this length, a maximum of 90 feet is exposed in cable trays, with the remaining cable routed through unsealed conduit. The HRRMs are installed at a 45-foot higher elevation than the containment penetration assemblies (Westinghouse Model WX-32916). As indicated in the above LER, during a loss-of-coolant accident and after permeating the cable jacket, moisture could form a water column inside the cable jacket and be forced into the containment penetration connector by the 45-foot pressure head developed by the cable elevation change. Further, the containment penetration assembly pigtails themselves use a cable similar to the HRRM cables. In discussions with the licensee regarding the similarities between the Rockbestos coaxial cable and the containment penetration pigtail cable, the licensee indicated that the jackets for both cables are identical in construction, thickness, and material. The jacket material for both cables is radiation cross-linked flame retardant non-corrosive modified polyolefin. In addition, the shield material underneath the jackets of both cables is very similar and the shield construction is the same. Thus, moisture could similarly permeate their jackets and short circuit the containment pigtail connector. This partial shorting of the circuit could result in the loss of the HRRM function.

In addition to HRRM circuits, the above mentioned cables may be used in other monitoring system applications. Further, the above mentioned penetration pigtails may also be used in other safety-related equipment applications. Failure or degradation of these items during or following design-basis accidents could significantly affect the functional performance of safety-related equipment.

In Information Notice 93-33, "Potential Deficiency of Certain Class 1E Instrumentation and Control Cables," dated April 28, 1993, the NRC staff noted that the insulation resistance of the Rockbestos coaxial cables may be too low to meet specifications for use in General Atomics radiation monitor circuits, depending on the environment to which the cable will be exposed. The low insulation resistance of these Rockbestos coaxial cables was the subject of a 10 CFR Part 21, "Reporting of Defects and Noncompliance," notification by General Atomics dated March 28, 1989.

This information notice requires no specific action or written response. If you have any questions about the information in this notice, please contact one of the technical contacts listed below or the appropriate Office of Nuclear Reactor Regulation (NRR) project manager.

Seymour H. Weiss for

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97-43	License Condition Compliance	07/01/97	All holders of OLs or CPs for nuclear power reactors
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97-39	Inadequate 10 CFR 72.48 Safety Evaluations of Independent Spent Fuel Storage Installations	06/26/97	All holders of OLs or CPs for nuclear power reactors. All holders of licenses for independent spent fuel storage installations
97-38	Level-Sensing System Initiates Common-Mode Failure of High-Pressure-Injection Pumps	06/24/97	All holders of OLs or CPs for nuclear power reactors

OL = Operating License
CP = Construction Permit

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